

SPRAY CALENDAR  
WITH  
SEED AND SOIL TREATMENT METHODS

OHIO  
Agricultural Experiment  
Station

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# BULLETIN

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### CALENDAR FOR THE TREATMENT OF PLANT DISEASES AND INSECT PESTS.

PREPARED BY W. J. GREEN, A. D. SELBY AND H. A. GOSSARD.

This calendar for the treatment of diseased conditions in plants is designed to cover the needs of farmers and horticulturists. It was first prepared at the request of the Ohio State Horticultural Society. Fungicides and insecticides may often be combined in spraying, and where Bordeaux mixture is used for fungus diseases, this practice is recommended. Spraying young orchards with Bordeaux mixture or other fungicides from time of planting, and of stocks in nursery row, is strongly recommended to preserve healthy conditions.

#### REMEDIES.

##### FUNGICIDES.

###### 1 Bordeaux Mixture I.

Copper sulfate (*blue vitriol*) 4 pounds.  
Quicklime (*not air slaked*) 4 pounds.  
(Of dry air slaked lime or hydrate of lime one-fourth more.)  
Water to make 50 gallons.

Dissolve the copper sulfate in about two gallons of hot water, contained in a wooden vessel, by stirring, or even better by suspending the sulfate contained in a cheese cloth sack, in a large bucketful of cold water. With the cold water and cheese cloth bag a longer time is required. Pour the sulfate solution into the barrel or tank used for spraying, and fill one-third to one-half full of water. Slake the lime by addition of a small quantity of water, and when slaked cover freely with water and stir. Pour the milk of lime thus made into the copper sulfate, straining it through a brass wire strainer of about 30 meshes to the inch. Pour more water over the remaining lime, stir and pour into the other; repeat this operation until all the lime but stone lumps or sand is taken up in the milk of lime. Now add water to make 50 gallons in the tank. After thorough agitation the mixture is ready to apply. The mixture should be made fresh before using, and any left over for a time should be thrown out or fresh lime added.

###### 2 Bordeaux Mixture II.

Copper sulfate, 2 pounds.  
Quicklime, 2 pounds.  
(Of dry air slaked lime or hydrate of lime one-fourth more.)  
Water to make 50 gallons.

*For use on such trees as have foliage injured by Bordeaux I.*

## STOCK SOLUTION AND LIME PUTTY.

A solution of copper sulfate, containing say one pound of sulfate to the gallon of water, may be made and permitted to stand indefinitely in a covered barrel if no lime is added. Such a solution is known as a stock solution and two or four gallons of this stock solution, according to the strength desired, is taken for each 50 gallons of the mixture to be made. For extensive spraying, a long trough or box of uniform width may be used, in which to slake and keep the lime. The quicklime is weighed out according to the amount needed, immediately placed in the trough and slaked with a small quantity of water. The whole is evenly spread and covered as a putty with water to exclude the air. This putty may be removed in calculated portions, placed in a tub and treated like the freshly slaked lime. By means of stock solution of copper sulfate and the lime in putty state, much valuable time is saved in filling the barrels or tanks used in spraying.

**3 Ammoniacal Solution of Copper Carbonate.**

Copper carbonate, 6 ounces.  
Ammonia, about three pints. (*Avoid excess.*)  
Water, 50 gallons.

Dissolve the copper carbonate in the ammonia and add the water.

**Caution**—Use no more ammonia than is required to dissolve the copper carbonate. Ammonia is variable in strength, and the amount required must be tested in practice.

To make copper carbonate: Dissolve ten pounds copper sulfate (*blue vitriol*) in ten gallons of water, also twelve pounds of carbonate of soda in same quantity of water. When cool, mix the two solutions slowly, stirring well. Allow the mixture to stand twelve hours and settle, after which pour off the liquid. Add the same quantity of water as before, stir and allow to stand the same length of time. Repeat the operation again, after which drain and dry the blue powder, which is copper carbonate.

**4 Soda Bordeaux Mixture.**

Copper sulfate, 4 pounds.  
Commercial caustic soda, soda lye, (*sodium hydroxid*)  
slightly in *excess* so that mixture is alkaline—ac-  
cording to strength, 1 lb. 5 oz. to 1 lb. 8 oz. by  
testing.

Water to make 50 gallons.

use instead of ammoniacal copper carbonate.

**Warning**—In each case of change of grade or brand of commercial caustic soda, it will be necessary to test the strength. Keep the mixture well agitated. (See Bulletin 130.)

**TO TEST THE STRENGTH OF CAUSTIC SODA.**

Provide materials and appliances described in Bulletin 130 and test carefully the reaction with both red and blue litmus. It is not safe to use this mixture without testing each lot of caustic soda used.

To keep caustic soda: After opening a container and testing, weigh out the entire contents into portions such as are needed to make a single spray tank of mixture; put in Mason jars under shelter, cover with a pint or so of water, and this portion is ready to be used as needed. Open packages of caustic soda will absorb water and increase in weight on standing; unopened packages will usually keep for a year or more.

**5 Potash Bordeaux Mixture.**

Copper sulfate, 4 pounds.

Caustic potash, potash lye, (*potassium hydroxid*) 1 lb.5 oz. to nearly 1 lb. 8 oz. as necessary for *slight excess*. (See Soda Bordeaux.)

Water to make 50 gallons.

For use like Soda Bordeaux mixture instead of ammoniacal copper carbonate.

**Caution**—Prepare like soda Bordeaux, only after test of the strength of the caustic potash.**6 Copper Sulfate Solution.**

Copper sulfate, 4 pounds.

Water to make 50 gallons.

Dissolve the sulfate as directed in Bordeaux I.

**Caution**—This solution will injure foliage. It can be used only before the buds open.**7 Bordeaux Mixture and Iron Sticker.**Copper sulfate, (*blue vitriol*) 2 pounds.Iron sulfate, (*copperas*) 4 pounds.

Quicklime, 6 pounds.

(Of dry air slaked lime or hydrate of lime one-fourth more.)

Water to make 50 gallons.

Proposed and recommended as substitute for Bordeaux I upon most fruits in foliage and upon certain vegetables, including especially apples, grapes and potatoes. The iron sulfate is precipitated by the lime as hydroxid and serves as a dilution sticker. The spray is rusty colored by reason of this iron compound.

**Note:** A stronger 4-4-8-50 formula may be used on *apple*, *pear* and *plum* before blossoms open.

**Caution**—Do not leave solution of iron sulfate standing beyond a second day, better to make fresh for each day.

**8 Potassium Sulfid Solution.**Potassium sulfid (*liver of sulfur*) 1 oz.

Water, 3 to 4 gallons.

This solution will not remain unchanged. The potassium sulfid must be kept in a well stoppered bottle. This may be made by a similar process to that of No. 9.

**9 Sodium Sulfid Solution.**

Commercial caustic soda, 2½ lbs.

Flowers of sulfur, 5 lbs.

After solution, water to make 50 gallons.

To make sodium sulfid at lowest cost: Place the caustic soda in a metal vessel and add a little hot water. Then stir in sulfur gradually, adding meanwhile hot water or applying heat. The chemical reaction will generate heat. With its progress the color will change from yellow to nearly brick red. No heat is required after complete solution unless lime be added. Don't add excess of water until the solution is effected. It may be made in quantity with external heat and kept during a day as stock solution. Excess of lime may be added with double and triple portion of sulfur to make the possible equivalent of lime-sulfur solution.

**Caution**—This solution is prepared for application on dormant trees. Care must be observed.

Upon foliage, as of peach, a strength greater than 1 lb. caustic soda to 2 lbs. sulfur is not to be recommended.

To make sodium sulfid for treating *seed potatoes*, use at the rate of 1 lb. caustic soda to 10 oz. sulfur for 36 gallons of solution.

**10 Self-Boiled Lime-Sulfur Mixture.**

Stonelime (only), 9 pounds.  
 Flowers of sulfur, 6 pounds.  
 Water to make 50 gallons.

Place the lime and sulfur together in a barrel or kettle and add enough cold water to slake the lime. Stir thoroughly and add more water if necessary to prevent the mixture from becoming sticky. As soon as the lime is well slaked, *dilute immediately* with cold water and strain through a sieve of about 20 meshes to the inch to remove coarse particles of lime, but the sulfur should all be worked through the strainer.

Proposed and recommended by W. M. Scott, U. S. Department of Agriculture, as a fungicide for use on peach trees in foliage. A 15-10-50 formula may also be used on the apple as a substitute for Bordeaux mixture.

*Caution*—While this may be used on the peach in foliage, and upon other fruits, care should also be exercised in the preparation of the mixture to avoid the formation of soluble sulfids as by use of hot water or allowing to stand before dilution, since these result in foliage injury from the spray.

**11 a Formaldehyde (Formalin) Solutions.**

For oats and wheat, 1 lb. or pint 40% formaldehyde to 40 or 50 gal. water.  
 For potato scab and rosette,  $\frac{1}{2}$  pint of formaldehyde to 15 gal. water.  
 For onion smut, 1 lb of formaldehyde to 25 or 33 $\frac{1}{2}$  gal. of water.  
 For soil drench, 2 lbs. or more of formaldehyde to 50 gal. of water.

**11 b Formaldehyde Gas.**

Commercial 40% Formaldehyde, 3 lbs.  
 Potassium Permanganate crystals, 23 ozs.  
 Sufficient for 1000 cu. ft. of space occupied by  
 crates or trays. [Maine Formula.]

Enclose open tiers or piles of slat crates filled with dry onions, potatoes, etc. in tight room or oiled tent of canvas buried in earth about the base. Generate the formaldehyde gas in a flat bottomed dish or pan of adequate capacity by placing one of the materials, as the liquid formaldehyde, in the pan, and adding the other the last thing before retiring. Then close tight and allow to remain closed 24 to 48 hours.

Proportionate or multiple unit amounts may be taken for smaller or larger enclosed spaces. Applicable to fumigation of seed potatoes for scab, sweet potatoes for rot troubles and to newly gathered, dry onions before storing for winter.

**12 Corrosive Sublimate.**

Corrosive sublimate, 2 ozs.  
 Water, 15 $\frac{1}{2}$  gallons.

Label POISON; used for potato scab and for disinfection.

To hasten solution, have druggist pulverize the sublimate.

**INSECTICIDES.****13 Kerosene Emulsion.**

Laundry soap (chipped),  $\frac{1}{2}$  pound.  
 Kerosene (coal oil), 2 gallons.  
 Water (preferably soft and free from  
 dirt particles), 1 gallon.

Dissolve the soap in the full amount of water and when this solution is boiling hot, remove from the fire and add the kerosene. Stir the mixture violently by driving it through a force pump back into the vessel until it becomes a creamy mass that will not separate. This requires usually from five to ten minutes. For use, dilute one part of the emulsion with 8 or 10 parts of water for scale

insects and hard bodied insects like the chinch bug. For soft bodied insects such as plant lice, lice on animals, etc., use one part emulsion to 15 or 20 parts of water. The stock emulsion will keep good for months if kept in air tight vessels.

Kerosene emulsion kills by *contact*, and therefore, the application should be very thorough. It may be used against a great many different pests, but is especially valuable for destroying those with sucking mouth-parts, for they cannot be killed with arsenical poisons.

*Caution*—Only the dilute emulsion, 1 part emulsion to 15 or 20 of water, should be used when the trees are in leaf, and in all cases it should be kept thoroughly stirred; otherwise the foliage or even the twigs will be injured.

#### 14 Lime-Sulfur Wash.

Stone lime, 15 to 20 pounds.  
(Of dry air slaked lime or hydrate of lime one-fourth more.)  
Flowers of sulfur, 15 pounds.  
Water, 50 gallons.

Slake the lime in a small quantity of hot water, gradually adding and stirring in the sulfur. Dilute mixture with twelve gallons of water and boil in an iron kettle or cook by steam in a covered tank or barrel for one hour or longer. Fill with water to the required fifty gallons. Strain the wash through a fine mesh strainer and apply hot. In using an iron kettle, keep the mixture vigorously boiling and thoroughly stirred to prevent caking and burning of the materials. Wash, cooked by steam, is more easily prepared and better made.

Apply wash in spring before buds open or in fall after leaves drop. Cover all parts of the tree with a heavy coat of the wash. If a single application is made per year for scale insects, especially for San Jose scale, it is advised that the treatment be given in the early spring. Where infestation is excessive, one spraying should be given in the fall after the leaves drop, and a second the following spring before the leaves appear. Also in case of large orchards it may be necessary to commence work in the fall so as to insure its completion before vernal in spring. Cover every bit of bark on every tree to insure success.

This remedy is perfectly safe in anybody's hands, if used during the dormant period. It is also a fungicide and controls peach curl as well as San Jose scale.

#### 15 Soap Solutions.

One or two pounds of fish oil soap dissolved in one gallon of water makes a good spray to use against San Jose scale in winter, but is not as effective or cheap as other remedies. One pound of fish oil soap or laundry soap, in 4 to 7 gallons of water is good against plant lice.

#### 16 Soluble or Miscible Oil.

Some commercial houses make brands of oil that readily emulsify with cold water and are used in winter at different dilutions for San Jose scale and also as summer applications. Some of these are valuable, and if used with care, are recommended as worthy of trial.

#### 17 Paris Green.

In combination with Bordeaux mixture, Paris green may be used at the rate of one pound in from 100 to 150 gallons.

When Bordeaux mixture is unnecessary, the Paris green may be used at the same rate, but two or three pounds of freshly slaked lime must be added to prevent burning of the foliage. Keep the mixture well stirred so that the poison will be distributed evenly.

In cases where successive sprayings are necessary, it is important to consider the accumulation of the poison and use a slightly weaker mixture, unless sufficient rain has fallen thoroughly to wash off the poison.

**18 Arsenate of Lead.**

Arsenate of soda, 4 ounces.

Acetate of lead, 11 ounces.

Water, 3 to 5 gallons.

Dissolve the ingredients separately, each in one-half to one gallon of warm water. Mix together and pour into spray tank containing from 50 to 100 gallons of water. Add the milk of lime from two or three pounds of freshly slaked stone lime.

This poison is in many respects the most satisfactory for spraying purposes of any of the arsenicals. It is more adhesive than Paris green and, if properly made from good materials, will burn foliage but little, no matter what strength is used. These remarks especially apply to the commercial brands on the market, which are, in some respects, more satisfactory than the home-made product. While costing more than Paris green, arsenate of lead is generally regarded as more economical in the end because of its superior sticking quality and, hence, greater efficiency. For most purposes, 3 pounds of the commercial product in 50 gallons of spray are used. Either water, Bordeaux mixture or No. 7 may be used as the carrier.

**19 Arsenite of Soda.**

Dissolve two pounds of commercial white arsenic and four pounds of carbonate of soda (washing soda) in two gallons of boiling water and use from one quart to three pints to a barrel of Bordeaux mixture (50 gallons).

Orchardists often use one pint of this poison with the addition of one and one-half pound of commercial arsenate of lead in 50 gallons of Bordeaux for spraying apples. Results seem as good as when full strength arsenate of lead is used, except that more burning of the leaves occurs.

The easiest way to make the solution is to put both the white arsenic and carbonate of soda in a gallon of boiling water and keep boiling about fifteen minutes, or until a clear liquid is formed, and then dilute to two gallons for stock solution.

*Caution*—This cannot be used alone safely, but must be applied in Bordeaux mixture or No. 7.

**20 Arsenite of Lime.**

White arsenic, 1 pound.

Lime, 2 pounds.

Water, 3 gallons.

Boil together for fully 40 minutes after the boiling point is reached. As a precaution against danger of burning, slake an additional pound of lime, add to it three or four gallons of water, and add to the boiled mixture. Strain and dilute to from 200 to 250 gallons for hardy vegetation such as potatoes. Do not use at all on stone fruits or on cucurbits. Dilute to 300 or 400 gallons for tender vegetation.

**21 White Hellebore.**

Because of quickly losing its poisonous properties, hellebore may be employed to spray fruits a few days before harvest when arsenical sprays would be dangerous. Use one ounce to three gallons of water.

**22 Pyrethrum.**

Pyrethrum is usually applied as a powder, with a bellows, but may be used as a spray at the rate of one ounce to two gallons of water. Poisonous to insect but not to higher animals. Can be used on ripening fruits.

**23 Tobacco Decoction.**

Boil one pound of tobacco stems or tobacco dust in one gallon of water for about one hour. Strain to remove dirt that would clog nozzle and add water to make two gallons of spray for each pound of tobacco used. Excellent for plant lice and does no injury to the most tender plants.



# SEED AND SOIL TREATMENTS.

| SEED OR PLANT                | FOR WHAT TREATED        | TREATMENT   | METHOD OF TREATMENT   |
|------------------------------|-------------------------|---|---|
| Barley.....                  | Smuts.....              | Formaldehyde or modified hot water.....   | Sprinkling with stronger formaldehyde as for oats is successful. Soak seed enclosed in sacks four hours in cold water, let stand wet four hours more and dip five minutes in hot water at 130 degrees Fahr., or three degrees lower than for other hot water treatments.  |
| Bean....                     | Anthracnose.....        | (See spray calendar)  |   |
|                              | Weevil .....            | Bisulfid of carbon .....  | Submit to fumes for twenty-four hours in air-tight vessel or chamber.   |
| Begonia.....                 | Nematodes .....         | Sterilize soil with steam.  | Disinfect soil to be used by heating with steam as described under cucumbers.   |
| Cabbage and Cauliflower..... | Club-root.....          | Quicklime on soil.....  | Apply stone lime (quicklime) preferably ground lime, before planting, at rate of 80 bushels per acre and work into the soil with suitable tools.  |
|                              | Maggot.....             | Bisulfid of carbon or tobacco dust .....  | Make hole in soil near roots, pour in about a teaspoonful of bisulfid of carbon and fill holes with soil. Cover soil around stalks freely with tobacco dust once per week.  |
|                              | Nematodes in hothouse   | Sterilize soil with steam   | See next.   |
| Cucumber.....                | Nematodes in hothouse   | Sterilize soil with steam   | Sterilize soil with steam by perforated pipes, high pressure 1 to 2 hours, or low pressure in sub-drains 4 to 5 hours.  |
|                              | Rcot-rot.....           | Drench soil with formaldehyde.....  | Drench soil with formaldehyde 3 to 4 lbs to 50 gallons of water preceding lettuce crop.   |
| Lettuce.....                 | Rosette.....            | Sterilize soil with steam or drench with formaldehyde .....                                 | Steam as above or drench with formaldehyde 1½ to 2 lbs. where trouble follows with cucumbers 3 to 4 lbs. to 50 gals. of water, 1 gal. solution to each sq. ft. of surface. Two weeks must elapse before setting plants.   |
|                              | Rot.....                | Steam soil.....   |   |
| Oats .....                   | Anthracnose.....        | Formaldehyde, .....   | Treat seed as stated in next to kill adhering spores. This is only a partial remedy.  |
|                              | Loose smut.....         | Sprinkle seed with formaldehyde or immerse seed in hot water. Soak seed in potas. sulfid... | { Preferably sprinkle a pile of seed with shoveling to saturate with formaldehyde solution, one gallon to bushel, at three or four sprinklings; after three or four hours or over night in the pile, spread dry.<br>Immerse seed contained in open vessel for ten minutes in hot water at 132.3 degrees Fahr., for seven minutes at 136 degrees Fahr., or for five minutes at 140.2 degrees Fahr., spread at once to dry. Soak seed in ¾ per cent. solution potassium sulfid for twenty-four hours with stirring, then dry. |
|                              | Insects in stored grain | (See wheat)   |   |
| Onion . .....                | Smudge.....             | Use formaldehyde as for onion smut.....   | Sow seed with formaldehyde as for onion smut; rotate onions with other crops.   |
|                              | Smut .....              | Use formaldehyde or ground quicklime. Plant other crop. Use sets or transplanted seedlings  | Use formaldehyde solution 1 lb. to 30 gals. of water sprinkled on seed in contact with soil and cover at once, or better sow with drill and dip attachment, the solution falling with the seed. Or apply ground quicklime at the rate of seventy-five to one hundred and twenty-five bushels per acre just previous to seeding on freshly plowed land, and stir into soil. (See Bulletin 131.)  |

(over)

# SEED AND SOIL TREATMENTS. Continued.

| SEED OR PLANT     | FOR WHAT TREATED        | TREATMENT   | METHOD OF TREATMENT   |
|-------------------|-------------------------|---|---|
| Onion.....        | Storage-rots.....       | Disinfect with formaldehyde gas.....                        | Fumigate to disinfect the dry onions, with formaldehyde gas in enclosed piles of slat crates for a period of 24 to 48 hours. (See description of method under No. 10 above.)  |
| Pea.....          | Anthrachnose (Blight)   | Spray the growing crop with Bordeaux.....                   | Keep down infection of seed through spraying of plants. See Spray Calendar.   |
| Potato.....       | Scab.....               | Soak uncut seed in formaldehyde or corrosive sublimate..... | Soak seed for 2 hours in formaldehyde or 1 hour in corrosive sublimate; then dry and plant on scab-free soil; formaldehyde gas may be used.   |
|                   | Rosette (Rhizoctonia)   | Soak seed in formaldehyde as for scab.....                  | Soak seed in formaldehyde as for scab; on infected soil use formaldehyde after manner in onion smut. (See Bulletin 145, or Handbook of Plant Diseases.)   |
| Roses.....        | Nematodes in hothouse   | Sterilize soil with steam                                   | Heat soil with steam as described above; thoroughly disintegrated soil from sod one year or more old is less dangerous. Lime water stimulates affected plants but is not a remedy.  |
| Rye.....          | Anthrachnose.....       | Formaldehyde.....   | Treat seed as for oats and wheat to kill spores. Remedy only partial.   |
| Sweet Potato..... | Black-rot and Stem-rot  | Formaldehyde.....   | Soak or fumigate seed roots as for potato scab; discard old diseased hotbeds; drench slightly diseased beds with formaldehyde as for lettuce and tobacco. Then set plants on new soil.  |
| Tobacco.....      | Root-rot and Bed-rot..  | Drench beds with formaldehyde or sterilize with steam.....  | Drench beds in fall or early spring with formaldehyde 2 lbs. or more to 50 gals. water, 1 gal. to each sq. ft. Do not seed until smell of formaldehyde has disappeared.   |
| Tomato.....       | Nematodes in hothouse   | Sterilize soil with steam                                   | As for roses and cucumbers above.   |
|                   | Point-rot in hothouse.. | Mulch or sub-water.....                                     | An insufficient water supply seems favorable to development of point-rot of green tomatoes.   |
| Turnip.....       | Club-root.....          | Quicklime in soil.....                                      | As for cabbage and cauliflower. Avoid succession of these crops.  |
| Violet.....       | Nematodes in hothouse   | Heat soil with steam..                                      | The time for prevention is by soil treatment beforehand as for cucumbers above.   |
| Wheat.....        | Anthrachnose.....       | Formaldehyde.....   | Sprinkling as for stinking smut may prove partial remedy.   |
|                   | Loose smut.....         | Modified hot water.....                                     | Soak seed four hours in cold water, let stand four hours more in wet sacks, immerse five minutes in water at 133 degrees Fahr. and dry.   |
|                   | Stinking smut.....      | Formaldehyde, hot water or copper sulfate.....              | Sprinkle grain in piles with formaldehyde as for oat smut, 1 gal. or less per bushel and dry in same manner.<br>Dip skimmed seed for ten minutes in hot water at 133 degrees Fahr. and dry on disinfected surface or immerse ten minutes in solution of blue vitriol (copper sulfate); dry with air-slaked lime by shoveling. Use two pounds of blue vitriol to ten gallons of water. Grain may be sprinkled in piles with copper sulfate or formaldehyde as for oats. (See Bulletin 97.) |
|                   | Insects in stored grain | Bisulfid of carbon, .....                                   | Place one pound of bisulfid of carbon for each 2,000 pounds of grain in bins. Cover surface with blanket to hold the fumes which will spread through the mass, killing all insect life. Use in tight bins or buildings and do not use near fire of any description.   |

# SPRAY CALENDAR.

| WHAT TO SPRAY  | FOR WHAT TO SPRAY        | WITH WHAT TO SPRAY   | WHEN TO SPRAY  |  |  |   | REMARKS AND CAUTIONS   |
|----------------|--------------------------|--|--|--|--|---|--|
|                |                          |  | First Spraying   | Second Spraying                        | Third Spraying                                 | Fourth Spraying   |  |
| Apple. ....    | Bitter rot....           | Soda Bordeaux or ammoniacal copper carbonate.....<br>Probably 7 on red apples.....       | With first appearance of rot.....                                  | One or two weeks after first.....      | Two weeks later.....                           | Not required if Bordeaux precedes .....                           | These follow Bordeaux for scab; danger on fair skinned apples.<br>For black rot follow scab syrays closely using Bordeaux and Iron Sticker as long as safe.<br>The spray just before blossoms open is very essential for scab. |
|                | Black rot....            |  |  |  |  |   |  |
|                | Scab.....                | Bordeaux mixture 17 or 10.....   | Just before blossoms open, Bord. I.....                            | Just after blossoms drop, 7 or 10..... | Same 7 to 10 days later                        | Rarely needed .....   |  |
|                | Sooty fungus..           | Bordeaux 1 .....   | After blossoms drop ...  | Two weeks later.....                   | Same as for scab.....                          | Same as for scab.   |  |
|                | Bud Moth.....            | Arsenites in Bord....  | With opening of buds   | 2 or 3 days later if worms remain..... | Same as second....                             | .....   |  |
|                | Canker worm..            | Arsenate of lead alone.....  | With first young worms   |  |  |   |  |
|                | Codlin moth...           | Arsenites or arsenates in Bordeaux 1 or 7, or arsenate of lead, 3 lbs to 50 gallons..... | As soon as blossoms fall   | 7 to 10 days later.....                | Second week in July..                          | Last week in July. Arsenate of lead alone on light colored apples | 17, 18 or 19 in Bordeaux are not quite as efficient as arsenate of lead alone.   |
|                | San Jose Scale.          | Lime-sulfur or 16.....   | Late in winter, early in spring or late in fall.....               |  |  |   |  |
|                | Oyster shell scale ..... | { Lime-sulfur<br>Kerosene emulsion or 16   | { Early spring with 14   | June 1-15, with 13 or 16               | For oyster shell scale Aug. 1-15 with 13 or 16 | .....   | In case of bad infestation spray in fall and repeat in spring.<br>{ Don't use strong emulsion or oil when trees are in full leaf.  |
|                | Scurfy scale..           |  |  |  |  |   |  |
| Aster.....     | Woolly aphid..           | Kerosene emulsion..  | When trees are in full leaf.....                                   | In fall                                |  |   |  |
| Asparagus..... | Blister beetle..         | Whale oil soap, or dilute chloro-naphtholeum.....  | When beetles appear..  |  |  |   | Use 1 pound soap to 6 gallons of water.  |
|                | Asparagus beetle.....    | Air-slaked lime or pyrethrum as a powder.....  | When larvae appear .   | Same as first .....                    | Same as first .....                            | Same as first .....   | Do not use arsenites, except in late summer. Repeat 3 to 4 times. Burn rusted brush in fall.   |
| Bean.....      | Asparagus rust.....      | Bordeaux I .....   | After cutting crop.....  | Ten days later .....                   | Ten days later.....                            | Ten days later .....  | Repeat if needed.  |
|                | Anthracnose..            | Bordeaux I.....  | Soak seed 1 to 2 hours in am. cop. carb. five times strength of 3. | Bordeaux on 2 or 3 in. plants.....     | Bordeaux 10 days later.                        | After blossoms.....   |  |
| Beet .....     | Leaf spot .....          | Bordeaux I.....  | When plants are 5-6 in. high.....                                  | Two weeks after first                  | Two weeks later.                               |   |  |

# SPRAY CALENDAR—Continued.

| WHAT TO SPRAY           | FOR WHAT TO SPRAY          | WITH WHAT TO SPRAY                     | WHEN TO SPRAY                           |   |   |                           | REMARKS AND CAUTIONS   |
|-------------------------|----------------------------|--|---|---|---|---------------------------|--|
|                         |                            |  | First Spraying                          | Second Spraying                                       | Third Spraying  | Fourth Spraying           |  |
| Cabbage and Cauliflower | Cabbage worm               | Pyrethrum .....                        | With first appearance of worms.....     | Whenever worms are observed.....                      | Same as second.....                                       | Same as second.....       | 1 oz. to 30 gallons water, or dust 1 to 10 of flour.                       |
|                         | Club root ....             | (See soil treatment.)                  |   |   |   |                           |  |
| Carnation .....         | Leaf or calyx mold.....    | Bordeaux I or ½ of 6.                  | Upon appearance of fungus .....         | Two weeks later....                                   | Two weeks later.....                                      | Repeat if needed.....     | Begin early before the calyces are ruined.....                             |
|                         | Leaf spot .....            | Bordeaux I or ½ of 6                   | Upon appearance of fungus .....         | Two weeks later.....                                  | Two weeks later.....                                      | Cover foliage well        |  |
| Catalpa .....           | Leaf spot.....             | Bordeaux I .....                       | Upon appearance of fungus.....          | 2 or 3 weeks later.....                               | Repeat if necessary... Before or after transplanting..... | Cover foliage well        |  |
| Celery .....            | Leaf spot or leaf blight.. | Bordeaux I.....                        | On young seedlings...                   | Repeat on seedlings...                                |   | Two weeks later.....      | Keep leaves well covered in plant bed                                      |
|                         | Root rot.....              | Drain soil                             |   |   |   |                           |  |
| Cherry Stocks..         | Leaf spot .....            | Bordeaux II .....                      | When leaves are half grown.....         | Two weeks later.....                                  | Two weeks later.....                                      | About two weeks later.    |  |
| Cherry .....            | { Leaf spot .. }           | Bordeaux II .....                      | When leaves are unfolding.....          | Two weeks later.....                                  | 2 or 3 weeks after second                                 |                           | First after blossoming. Often necessary to treat after crop is gathered.   |
|                         | { Mildew .... }            |  |   |   |   |                           |  |
|                         | Rot.....                   | Bordeaux I and II...                   | Before blossoming I....                 | After blossoms drop, II on fruit.....                 | Two weeks later, II on fruit .....                        | 2 weeks later, II, 3 or 4 | Use 3 or 4 when fruit is large.  |
|                         | Aphis.....                 | Soap solution .....                    | On first appearance of aphids.....      |   |   |                           | Difficult to reach aphids. Use 1 lb. of soap to 4 gallons of water.        |
|                         | Cherry slug....            | Arsenate of lead in Bordeaux I.....    | After fruit harvest when slugs appear.. | Repeat if slugs remain. As blossoms dry up in II..... |   |                           | Air slaked lime may be used.   |
|                         | Curculio .....             | Arsenate of lead in Bordeaux I and II. | Before blossoming in I....              |   | One week later in II...                                   |                           | Avoid strong solutions. Do not use other arsenicals than arsenate of lead. |
|                         | San Jose Scale.            | 14 or 16.....                          | Before buds open.....                   |   |   |                           |  |
| Cineraria ....          | Mildew.....                | Bordeaux I or ½ of 6                   | When mildew appears in spring.....      | Two weeks later.....                                  | Repeat if necessary....                                   |                           |  |
| Chrysanthemum .....     | Leaf spot ....             | Bordeaux II or ½ of 6                  | July 1.....                             | Two weeks later.....                                  | Repeat if necessary....                                   |                           |  |
| Cucumber.....           | Anthracoise..              | Bordeaux I.....                        | When plants begin to vine.....          | Two weeks later....                                   | Two weeks later.....                                      | Two weeks later.....      | Repeat as necessary. Repeat at weekly intervals                            |
|                         | Downy mildew.              | Bordeaux 1.....                        | July 25 to August 1....                 | Eight to ten days later                               | Eight to nine days later                                  | Eight days later.....     |  |
|                         | Root rot.....              | (See soil treatment)..                 |   |   |   |                           |  |
|                         | Spot of fruit...           | Bordeaux 1.....                        | After first blossoms...                 | Ten days later.....                                   | Two weeks after second                                    | Two weeks after third.    | Apply to fruit carefully   |
|                         | Nematodes ....             | (See soil treatment.).                 |   |   |   |                           |  |

# SPRAY CALENDAR—Continued.

| WHAT TO SPRAY  | FOR WHAT TO SPRAY   | WITH WHAT TO SPRAY  | WHEN TO SPRAY   |  |  |                                 | REMARKS AND CAUTIONS   |
|----------------|---|---|---|--|--|---------------------------------|--|
|                |   |   | First Spraying  | Second Spraying  | Third Spraying   | Fourth Spraying                 |  |
| Cucumber.....  | Cucumber beetle.....  | Arsenate of lead in Bordeaux I. Or sprinkle and mulch freely with tobacco dust.....                         |   |  |  |                                 |  |
| Currant.....   | Leaf spot.....  | Bordeaux I.....   | Soon as plants appear.  | Week later.....  | Week after second.....   | Week after third.....           | Week after fourth. Fourth necessitates washing fruit.                              |
|                | Plant bug.....  | Kerosene emulsion or 16.....  | As leaves are unfolding   | Two weeks later.....   | Two weeks later.....   | 2 or 3 weeks later.....         |  |
|                |   |   | May.....  | Early in June if necessary.....  |  |                                 |  |
| Gooseberry.... | San Jose Scale.   | Lime-sulfur or 16.....  | As with the apple.....  | In spring as with apple.....   |  |                                 | Look for worms on under side of leaves first.                                      |
|                | Worm.....   | White hellebore.....  | When worms first appear.....                                      | In 3 or 4 days repeat..  | Repeat as second.....  |                                 |  |
|                | Leaf spot.....  | Bordeaux I.....   | As currants with leaf spot.....                                   | As currants with leaf spot.....  | As currants with leaf spot.....  | As currants with leaf spot..... |  |
| Grape.....     | Mildew.....   | Bordeaux I or 8.....  | Before leaves open I....  | After blossoming I....   | Pat. sulfid 2 weeks later.....   |                                 | Bordeaux coats fruit if used for 3rd. Sodium sulfid may be substituted for 8.      |
|                | Worm.....   | White hellebore.....  | As on currants.....   |  |  |                                 |  |
|                | Anthracnose... Berry moth... Downy & powdery mildew. Rot..... | Bordeaux 1..... Arsenate of lead with Bordeaux 1 or 7... Bordeaux 1 or 7... Bordeaux 1 or 7 and 3 or 4..... | Just before buds open.. Before bloom..... Just before blossoming. | Just before blossoming After fruit has set.... After fruit has set.... | Just after fruit has set July 1 to July 15..... 10 to 15 days later..... | 10 days later Bordeaux          |  |
| Horse Chestnut | Leaf hopper....   | Kerosene emulsion or 16.....  | Before young can fly...   |  |  |                                 | 7 good. Follow by two or three sprayings with Soda Bordeaux or am. cop. carbonate. |
|                | Leaf spot or blight.....                                      | Bordeaux I.....   | When leaves are half grown.....                                   | Two weeks later.....   | Two weeks after second   | 2 or 3 weeks later              |  |

# SPRAY CALENDAR—Continued.

| WHAT TO SPRAY   | FOR WHAT PO STRAY        | WITH WHAT TO SPRAY                       | WHEN TO SPRAY                               |  |  |   | REMARKS AND CAUTIONS   |
|-----------------|--------------------------|--|---|--|--|---|--|
|                 |                          |  | First Spraying                              | Second Spraying                              | Third Spraying                               | Fourth Spraying                                 |  |
| Lettuce.....    | { Rosette.... }          | See soil treatment.                      | In seed bed or when plants begin to vine    | 2 weeks later Bord. 1..                      | Two weeks later.....                         | Two weeks later.....                            | Repeat as necessary; use II very early   |
| Muskmelon...    | { Rot or drop }          |  |   |  |  |   |  |
|                 | Anthrachnose...          | Bordeaux I and II...                     | Bordeaux II.....                            | 8 to 10 days later.....                      | 8 or 9 days later.....                       | Eight days later                                |  |
|                 | Downy mildew...          | Bordeaux I.....                          | July 25 to August 1...                      |  |  |   |  |
|                 | Leaf blight....          | Bordeaux I.....                          | When plants begin to vine.....              | Three weeks later....                        | 3 weeks after second...                      | Two weeks after third.                          | Repeat same.   |
| Oats .....      | Anthrachnose...          | (See seed treatment.)                    | When green fly appears                      | Two weeks later.                             |  |   |  |
|                 | Blade blight...          | Soap solution or kerosene emulsion . . . |   |  |  |   |  |
|                 | Smut .....               | (See seed treatment.)                    |   |  |  |   |  |
| Onion.....      | { Smut..... }            | (See seed treatment.)                    |   |  | Repeat if needed.                            |   |  |
|                 | { Storagerots }          |  |   |  |  |   |  |
| Pea .....       | { Blight..... }          | Bordeaux I.....                          | Just before bloom.....                      | Two weeks later.....                         |  |   |  |
| Peach.....      | { Mildew..... }          |  |   |  |  |   |  |
|                 | Leaf curl.....           | Bordeaux I, or 6....                     | In fall, or March, Bordeaux I, 6 or 14..... | As buds are opening I, 6 or 20.....          | Just after calyx drops, Bordeaux II .....    | Not required, ditto 3d, if others are well done | Lime-sulfur for first instead of Bordeaux I when scale is present. Cover fruit well. |
|                 | Pustular spot..          | Bordeaux II or 10....                    | Just after calyx drops.                     | Two weeks after first..                      | Two weeks later.....                         |   |  |
|                 | Rot.....                 | Bordeaux I and 10 or Bordeaux II.....    | As buds are swelling 1 or 14.....           | Just after calyx drops 10 or Bordeaux II.... | 3 or 4 weeks later 10 or Bordeaux II....     | As fruit begins to color 10 or Bordeaux II....  | Every 7-10 days repeat. Destroy all mummies. 3 may be used 4th.                      |
|                 | Scab .....               | Bordeaux I, 6, 8 or 14                   | As buds are swelling Bordeaux I, 6, 8 or 14 | Just after calyx drops 10 or Bordeaux II ..  | 2 weeks later 10 or Bordeaux II, 8 or 9 .... | Repeat third .....                              | 10 appears safest remedy. Use only half usual amount of poison.                      |
|                 | Bud moth.....            | Arsenites in Bord. I                     | With opening of buds .                      |  |  |   |  |
|                 | San Jose Scale.          | Lime-sulfur or 16....                    | In late fall or early spring                |  |  |   |  |
| Pear Stocks.... | Leaf spot or blight..... | Bordeaux 1.....                          | When leaves are half grown ..               | Two weeks later.....                         | Two weeks later.....                         | Two weeks later.....                            | 5 to 7 sprayings are needed  |
| Pear .....      | Leaf blight....          | Bordeaux 1 or 7 & 3 or 4 .....           | Before blossoms open..                      | Two weeks later, 1 or 7                      | 2 weeks after second..                       | Bordeaux may make russet fruit.....             | Use 3 for 3rd, not Bordeaux after 2nd. Bordeaux after second may injure the fruit.   |
|                 | Scab .....               | Bordeaux I.....                          | When leaves are half grown .....            | After blossoms drop...                       |  |   |  |
|                 | Bud moth.....            | Arsenites in Bord. I.                    | With opening of buds..                      |  |  |   |  |
|                 | Canker worm..            | Arsenate of lead...                      |   |  |  |   | See apple  |
|                 | Codlin moth..            | Arsenites in Bord I..                    | As with the apple.....                      | Same as first .....                          |  |   | See apple.   |

# SPRAY CALENDAR—Continued.

| WHAT TO SPRAY  | FOR WHAT TO SPRAY             | WITH WHAT TO SPRAY  | WHEN TO SPRAY  |                                       |  |   | REMARKS AND CAUTIONS   |
|----------------|-------------------------------|---|--|---------------------------------------|--|---|--|
|                |                               |   | First Spraying   | Second Spraying                       | Third Spraying                           | Fourth Spraying                             |  |
| Pear .....     | San Jose scale.<br>Slug ..... | Lime-sulfur or 16 ....<br>Arsenites in Bord. I or<br>dust with slaked | In winter or early<br>spring .....                             |                                       |  |   |  |
| Plum .....     | Pockets or<br>Bladders.....   | lime.....<br>Bordeaux I or Lime-<br>sulfur.....                       | When slugs appear....  | Repeat if slugs remain.               |  |   |  |
|                | Rot .....                     | Bordeaux I, also 3 or 4   | In March, I or 14.....<br>As buds are swelling<br>I or 14..... | Just after calyx drops<br>I or 7..... | Three or four weeks<br>later I or 7..... | As fruit begins to color<br>use 3 or 4..... | Treat as for leaf curl of<br>peach<br>Every 7-10 days repeat 4th;<br>useless to spray for rot,<br>unless mummies are<br>destroyed. |
|                | Shot-hole fun-<br>gus .....   | Bordeaux I or 7.....  | When leaves are half<br>grown. ....                            | Three weeks later.....                | 3 weeks later if needed.                 | Repeat .....                                | Protect to end of season....   |
|                | Curculio.....                 | Arsenate of lead in<br>Bordeaux I.....                                | With starting of buds.   | Just after calyx drops.               | Five days later.....                     |   | Jar, gather and destroy<br>curculios and stung<br>plums in addition.   |
|                | Aphis.....                    | Soap solution .....   | On appearance of aph is  |                                       |  |   | Use 1 lb. soap to 6 gal.<br>water.   |
|                | San Jose Scale.               | Lime-sulfur or 16.....  | In late fall or early<br>spring.....                           |                                       |  |   |  |
| Potato .....   | Early blight...               | Bordeaux I or 7.....  | When plants are 6 in.<br>high.....                             | Two weeks later.....                  | Two weeks later.....                     | Two weeks later if<br>needed .....          | Seed selection desirable.<br>Repeat at two week inter-<br>vals until crop is mature.   |
|                | Late blight...                | Bordeaux I or 7.....  | July 15-20.....  | Two weeks later.....                  | Two weeks later.....                     | Two weeks later.....                        |  |
|                | Rosette .....                 | (See seed treatment )   |  |                                       |  |   |  |
|                | Blister beetle..              | Whale oil soap or di-<br>lute Chloro-nap-<br>tholeum . . . . .        | When beetles appear  | Repeat if necessary....               |  |   | Use 1 lb. soap to 6 gal. of<br>water.  |
|                | Colorado beetle               | Arsenites alone or in<br>Bordeaux I.....                              | When beetles or young<br>appear.....                           | As for first.....                     |  |   | Arsenate of lead, 3 lbs. to<br>50 gallons of water, for<br>Colorado beetle alone.  |
|                | Flea beetle.....              | Bordeaux I or 7 com-<br>bined with 18 ....                            | When beetles appear..  | Repeat if necessary....               | As for first and second                  |   |  |
| Cherry Stocks. | Leaf spot .....               | Bordeaux I.....   | When leaves are half<br>grown .....                            | About two weeks later                 | Two weeks later.....                     | Two weeks later.....                        | Perhaps 5th spraying will<br>be needed.  |
| Quince.....    | Leaf spot .....               | Bordeaux I and 7....  | When leaves are half<br>grown .....                            |                                       | Two weeks later I or 7.                  | Two weeks later .....                       | First should come before<br>blossoms open  |
|                | Fruit and leaf<br>spot.....   | Bordeaux I.....   | Just before blossoms<br>open.....                              | After blossoms drop...                | Two weeks after second                   | Two weeks later.                            |  |
|                | San Jose scale.               | Lime-sulfur or 16 ....  | In late fall or early<br>spring.....                           |                                       |  |   |  |

# **SPRAY CALENDAR—Concluded.**

| WHAT TO SPRAY            | FOR WHAT TO SPRAY         | WITH WHAT TO SPRAY                               | WHEN TO SPRAY                          |                                   |                          |                          | REMARKS AND CAUTIONS                    |
|--------------------------|---------------------------|--|--|-----------------------------------|--------------------------|--------------------------|---|
|                          |                           |  | First Spraying                         | Second Spraying                   | Third Spraying           | Fourth Spraying          |   |
| Raspberry and Blackberry | Anthracnose...            | Bordeaux I and II..                              | Before leaves open use I               | II on young canes 6 in. high..... | Repeat 2d, 1 week later. | .....                    | Keep spray from leaves on bearing canes |
|                          | Leaf spot .....           | Bordeaux I.....                                  | When leaves are half grown .....       | Two weeks later.....              | Two weeks later.         | .....                    |   |
| Rose.....                | Saw fly .....             | Pyrethrum or hellebore.....                      | As for currant worm..                  | In 3 or 4 days repeat...          | .....                    | .....                    | Bordeaux shows on plants.               |
|                          | Leaf spot .....           | Bordeaux I or ½ of 6                             | With first appearance of fungus.....   | 2 or 3 weeks later.....           | Repeat if necessary....  | .....                    |   |
| Rye.....                 | Nematodes ....            | (See soil treatment.)                            | .....                                  | .....                             | .....                    | .....                    | Use 1 lb. to 6 gallons of water         |
|                          | Slug .....                | Arsenites in Bord. II or hellebore ..            | On appearance of slugs                 | Repeat if needed.                 | .....                    | .....                    |   |
| Strawberry....           | Anthracnose..             | (See seed treatment)                             | On new growth after crop.....          | 2 or 3 weeks later                | .....                    | .....                    | Use 1 lb. to 6 gallons of water         |
|                          | Leaf spot .....           | Bordeaux I, 7 or 10..                            | With first appearance of spots .....   | 2 or 3 weeks later.....           | 2 or 3 weeks later.....  | 3 weeks later if needed. |   |
| Sugar Beets ...          | Leaf spot .....           | Bordeaux I.....                                  | When beetles appear.                   | .....                             | .....                    | .....                    | Use 1 lb. to 6 gallons of water         |
|                          | Blister beetle..          | Whale oil soap or dilute Chloro-naphtholeum..... | When beetles appear..                  | .....                             | .....                    | .....                    |   |
| Tobacco .....            | Flea beetle....           | Bordeaux I combined with 18.....                 | When beetles appear..                  | .....                             | .....                    | .....                    | Use 1 lb. to 6 gallons of water         |
|                          | Root rot and bed rot..... | (See soil treatment.)                            | Soon after fruit begins to set.....    | Three weeks later.....            | Three weeks later.       | .....                    |   |
| Tomato.....              | Anthracnose...            | Bordeaux I.....                                  | Three weeks after transplanting.....   | Three weeks after first           | Three weeks later.....   | Three weeks later.       | Bordeaux I, some danger.                |
|                          | Leaf blight ...           | Bordeaux 1.....                                  | .....                                  | .....                             | .....                    | .....                    |   |
| Watermelon...            | Point rot.....            | (See soil treatment.)                            | When plants begin to vine.....         | Three weeks after first           | Three weeks later.....   | Three weeks later.....   | Bordeaux I, some danger.                |
|                          | Anthracnose...            | Bordeaux II.....                                 | July 25 to August 1....                | Eight to ten days later           | Eight to nine days later | .....                    |   |
| Wheat.....               | Downy mildew              | Bordeaux II.....                                 | As disease appears on muskmelons ..... | Repeat as on muskmelons.....      | As on muskmelons....     | As for cucumbers         | Bordeaux I, some danger.                |
|                          | Leaf blight ..            | Bordeaux II.....                                 | .....                                  | .....                             | .....                    | .....                    |   |
| Wheat.....               | Anthracnose, Smut, etc..  | (See seed and soil treatment.)                   | .....                                  | .....                             | .....                    | .....                    | Bordeaux I, some danger.                |
|                          | .....                     | .....  | .....                                  | .....                             | .....                    | .....                    |   |